CALIFORNIA MICROWAVE

June 4, 1992

Office of the Secretary,
Federal Communications Commission,
1919 M. St., N.W.
Washington, DC 20554

Re: ET Docket 92-9

Please find enclosed the comments of California Microwave, Inc. relevant to the referenced Notice of Proposed Rulemaking.

Sincerely,

CALIFORNIA MICROWAVE, INC.

David B. Leeson

Dr. David B. Leeson
Chairman

Before The
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Redevelopment of Spectrum to	)	
Encourage Innovation in the	)	ET Docket No. 92-9
Use of New Telecommunications	)	
Technologies	)	

To: The Commission

COMMENTS OF CALIFORNIA MICROWAVE, INC.

California Microwave, Inc. (hereinafter "CMI") hereby responds to the Notice of Proposed Rule Making ("NPRM") in ET Docket No. 92-9, released February 7, 1992. In the NPRM, The Commission proposes to establish new frequency bands between 1.85 and 2.20 GHz, and to require relocation of incumbents to other microwave bands or alternative media.

SUMMARY OF POSITION

CMI supports the proposed rulemaking in support of new frequency bands for the application of emerging technologies to mobile and portable services, and suggests that the same technologies (e.g., packet and spread-spectrum) that make these services possible may also be applied, through retrofit or modernization of current fixed systems, to reduce the cost or spectrum requirements of relocating existing services. Paragraphs on which we have not specifically commented are supported by CMI.

As an outcome of recent international WARC-92 activity to locate new mobile or portable services in the frequency bands below 3 GHz, CMI envisions a world-wide proliferation of new products designed to be used in the proposed frequency bands. These products can offer a broad range of services, including mobile and portable digitized voice and data. Radio signals within these new bands can incorporate a wide range of bandwidths, field strengths, modulation formats, and spurious emission levels so long as they can coexist. Maximum public utilization will be obtained if the spectrum allocations avoid conflicting applications within the same allocations that are likely to result in strong mutual interference.

Accordingly, CMI directs attention to the concept that the new frequency bands will be considered investment-worthy by industry (and therefore will result in the early availability of inexpensive, high-volume products) to the extent they do not require simultaneous use in the same spectrum of both narrowband and wideband signals, and/or both low-power short-range and high-power long-range signals. This segmentation is viewed by us as an important concept if the new bands are to support meaningful investment in new devices and services.

With respect to existing important users of this range of frequency bands, CMI directs attention to the opportunity to apply the same new technologies to ease the technical

or financial burden of relocation. In many past cases, industry has been able to develop modernization or retrofit kits so that existing microwave radio systems can apply more spectrum-efficient or interference-tolerant modulation approaches or can be moved to other frequency bands by the replacement only of the modulating or frequency-sensitive elements of the microwave system. Also, less expensive microwave radio systems operating at 18 GHz and above can serve the shorter 2 GHz paths currently used by present licensees.

SPECIFIC APPLICATIONS FOR DIGITAL DATA SERVICES (¶ 4-8)

Specific application examples for digital data services are offered, drawn from current ISM-band experience. In addition to envisioned wireless interconnection among laptop/palmtop computers and personal portable telephones to the overall network infrastructure, these applications include retail point-of-sale networking, power-utility substation internal control, municipal traffic light control systems and mobile medical patient-monitoring systems.

To focus on our own experience with specific applications for wireless local area networking, CMI is currently serving four different customer communities. First, wireless local area networking is being applied by our customer Marks and Spencer, the UK retail chain, to interconnect point of sales terminals to the central computer in each of its new stores. This application results both from M&S's policy to rearrange each store, typically on a monthly basis to enhance customer interest and from the fact that M&S favors historic buildings for its facilities. Experience with wired networks showed substantial costs and downtime from service wear and tear on connectors and cables, and historic buildings do not lend themselves to wired interconnection. These installations provide some 800 foot range within a multi-story concrete structure.

Second, CMI has delivered some 25,000 licensed radios for water and power utilities and for oil and gas producers and pipelines. These are used for remote measurement and control in locations that are either inconvenient or unsafe for normal wiring. Additionally, CMI satellite communications have been used in the same context for nuclear power plant safety surveys. These same customers are finding applications where licensed frequency bands are fully occupied and are asking for unlicensed wireless LAN capabilities for last mile or local applications between their already-existing sources of data.

Third, CMI has been approached to adapt its wireless LAN radios for municipal applications, particularly traffic light control. In this application, the flexibility and range of Part 15 ISM band equipment meets an existing need that has not heretofore been served at an acceptable price. Broader applications of this type can be served by the new allocations envisioned in the current NPRM.

Last, a significant application of wireless LAN technology is in the medical and health care area. CMI is conducting experimental tests with hospitals aimed at establishing the viability of patient monitoring systems both for ambulatory patients and for those on gurneys. Additionally, the same systems have been applied to data communications from an arriving ambulance to emergency room and central records areas. These applications resolve long-standing problem—real-time medical monitoring is not available in the situations in which the patient is at greatest risk because of being transported or moved within the hospital.

The attached appendix lists summarize the broader range of applications that will be served by improved wireless LAN capabilities. Almost any situation involving mobility or portability recommends itself for wireless application. CMI actively supports the allocation

of additional frequencies occupied only by broadband, low power signals for both voice and data personal communications.

TECHNICAL REQUIREMENTS FOR CO-USE OF SPECTRUM (¶ 9-21)

It is technically difficult to intermix broadband signals such as spread-spectrum CDMA or data with narrowband sinusoidal interferers. Also, it is difficult to implement systems with both low-power short-range signals and high-power long-range signals. Some comments are offered on why the existing Part 15 ISM bands have not attracted as much investment as anticipated, with implications for new frequency allocations.

In order to provide meaningful local area networking services, a wireless system must be able to transfer data for multiple users at rates comparable to the current wired network standards, such as IEEE 802.3 (10 Mb); accordingly, to accommodate several users in close proximity without interference this type of service will require RF bandwidths of the order of several ten's of MHz. Similarly, spread-spectrum CDMA voice systems require adequate processing gain, which results in a similar bandwidth requirement. If there are no narrowband interfering signals permitted, it is possible that spread-spectrum voice and data systems could share spectrum if the bandwidth needs are met for multiple users (*e.g.*, 40 to 100 MHz). The application of error-detecting packet technology and LAN protocols makes unlicensed applications possible because of the ability to resend packets if interference (collisions) is detected.

Although Part 15.247 and 15.249 systems are coming into broader use, it is felt that the potential presence of competing narrowband, high-power interfering signals in the ISM bands has been viewed by users and industry as an impediment to reliable system operation. This has slowed both developmental investment and user acceptance, although systems exist that are quite robust in the presence of interference, albeit at a cost of additional complexity. The implication for new primary or exclusive allocations is that users and product developers alike will view the availability of spectrum that is free of technically noncompatible interferers as a sign that it is safe to invest at a much faster pace. Because of widespread industry investment already made in the ISM bands, CMI feels it would be damaging to the industry if those segments were to be taken away as part of any new allocations under the present NPRM.

TECHNICAL COMMENTS REGARDING REALLOCATION OF EXISTING SERVICES (¶ 22-27)

CMI recognizes the critical importance of communications in the public-utility and law-enforcement areas. While it is possible that some of the new services made possible by the allocation of new frequency bands will also be of direct service to these public users, careful thought must be given to minimizing the cost and service-loss exposure of reallocation to other frequencies or media.

Past microwave industry experience has shown that modernization or retrofit concepts often provide very cost-effective means of adapting new technology into existing systems. CMI's own experiences in retrofitting the Bell System TD-2 and TD-3 radio networks support the concept that technology insertion by subsystem replacement can be cost-effective. Additionally, some substantial portion (possibly more than half) of existing 2 GHz paths may short enough to be served by recently-developed inexpensive microwave radio systems operating at 18 GHz and above.

Without minimizing the scale or potential cost of relocating important fixed services in the 2 GHz region, CMI suggests that the overall potential benefits of broad applications

of personal electronic messaging and communications make the effort necessary. The costs to existing users should be estimated accurately, taking all technological options into account, and the benefits to new users must be paid for in some fair way.

CONCLUSION

CMI respectfully urges The Commission to adopt the provisions of the NPRM, with due consideration to creating investment-worthy opportunity to serve the broad population with new personal communications devices while exploring the opportunity to apply new technologies to minimize the cost of relocation of existing important fixed users.

For the new frequency bands to be of maximum use for personal communications, CMI urges that the bands allocated to broadband voice and data services not include narrow-band, high-power potential interfering signals.

Respectfully submitted

CALIFORNIA MICROWAVE, INC.

by 

Dr. David B. Leeson
Chairman

Date: June 4, 1992

Identifying Market Segments for Low Speed Wireless LAN Systems

This matrix shows Industry as defined by IEEE 802.11 across the columns. In the next row are shown Applications in each Industry across the columns. The Traffic Profile heading of each row is the name of a specific traffic distribution associated with the use of each of the Applications. The check mark ✔ indicates that the Traffic Profile is generated by the Application.

The shaded Profile rows indicate Applications that (according to at least one member of 802.11) are acceptably serviced by a MAC channel rate of 100 Kbps. Observably, other Traffic Profiles can be supported by MAC speeds of 100 Kbps, but these have not been officially identified by IEEE 802.11. An obvious example is Supermarket checkout (Barscan).

Notice that where a ✔ appears in a shaded matrix entry, a specific Industry and Application have been identified for any Wireless LAN system operating at a MAC rate of at least 100 Kbps.

APPENDIX A

Industry ➡	Education			Finance		Industrial Automation/Manufacturing								Medical	Meetings			Office	Retail			Warehousing	Multimedia Services
Application ➡ Traffic Profile ⬇	Classroom	Campus	Field Study	Small Trading Floor	Large Trading Floor	Service Area & remote sites	Service & remote equipment	Assembly line carriers	Monitor/control of dispersed/inaccessible equipment	Material Handling	Mobile terminal access to a LAN	CAN download	Other Manufacturing		Conferences	Structured	Working groups		POS	Hand Held pricing and receiving	Bar code scanner		
File Transfer	✔			✔											✔		✔	✔					
File Access															✔	✔	✔	✔					
Transaction Processing				✔		✔												✔					
Data Collection																						✔	
Standard LAN		✔																					
Mobile Collaboration			✔																				
Terminal Emulation						✔												✔					
Jerry Car							✔																
Strap Crane							✔																
Automated Guided Vehicle Control								✔															
Automated Guided Vehicle Downloads								✔															
Transducer Data Collection									✔														
Programmable Logic Controller (PLC) Control									✔														
PLC Download									✔														
Material Handler Control										✔													
Process Control Supervisor											✔												
Maintenance and Repair Technician											✔												
Welder Robot Control												✔											
Welder Robot Download												✔											
Manufacturing Monitoring													✔										
Manufacturing Coordination													✔										
Distributed Manufacturing Control													✔										
Process Control Alarm Reports													✔										
Medical Imaging														✔									
Patient Care Information System														✔									
Department Store																			✔	✔	✔		
Discount checkout																			✔	✔	✔		

Industry ➡	Education			Finance		Industrial Automation/Manufacturing								Medical	Meetings			Office	Retail			Warehousing	Multimedia Services
Application ➡ Traffic Profile ⬇	Classroom	Campus	Field Study	Small Trading Floor	Large Trading Floor	Service Area & remote sites	Service & remote equipment	Assembly line carriers	Monitor/control of dispersed/inaccessible equipment	Material Handling	Mobile terminal access to a LAN	CAM download	Other Manufacturing		Conferences	Structured	Working groups		POS	Hand Held pricing and receiving	Bar code scanner		
Supermarket checkout (Barscan)																							
Financial POS																			✔	✔			
Program Download																			✔	✔			
Data Base Access																						✔	
Real-time Voice																		✔	✔			✔	
Scrap Crane Voice (uncompressed)							✔																
Real-time Voice (Compressed)																							✔
Real-time MPEG Voice (Compressed)																							✔
Real-time video																		✔					
Slow Scan Video						✔																	
Pit Crane Video (uncompressed)							✔																
Real-time Video Conferencing (Compressed)																							✔
Real-time MPEG NTSC Video (Compressed)																							✔
Real-time HDTV (Compressed)																							✔
Non-Real-time MPEG NTSC Movie (Compressed; 900 s response)																							✔
Non-Real-time HDTV Movie (Compressed; 900 s response)																							✔
Non-Real-time JPEG Photo (Compressed; 1 s response)																							✔
Non-Real-time JPEG X-Ray (Compressed; 10 s response)																							✔

Configuration Summaries

Industry	Education			Finance		Industrial Automation/Manufacturing								Medical	Meetings			Office	Retail			Warehousing	Multimedia Services
Application Config	Classroom	Campus	Field Study	Small Trading Floor	Large Trading Floor	Service Area & remote sites	Service & remote equipment	Assembly line carriers	Monitor/ control of dispersed/inaccessible equipment	Material Handling	Mobile terminal access to a LAN	CAM download/Welder Robot	Other Manufacturing		Conferences	Structured	Working groups	Dept	DEPT	Discount checkout	Supermarket		
Number of Stations	200	5000	50	200	10000	5, 10	1, 3	1500	10, 30	50, 100	3, 10	1000	5, 200	100, 1000	30, 500	5, 30	≤5	50	60	50	75	10, 40	
Station Density (Number/Hectare)	2000	2	50	20000	8000	5, 10	1, 3	4000	100	500	2, 10	100	2, 50	10, 100	2500	600	1200	300	60	2000	2000	3, 15	
Dimension (m)	30	5000	100	10	200	100	10, 1000	15	100	1000	1000	100	100	500	50	5, 50	<5	100	100	100	100	100	
Application List	• Data collection • Collaboration • File transfer	• Collaboration • File transfer	• Data collection • Collaboration • File transfer	• Trading • Order entry • File transfer	• Trading • Order entry • File transfer	• Slow scan video • X-Window emulation • TP/Database access	• Jerry car • Strap crane • Pit crane • Scrap crane	• Control • File transfer & download	• Transducer data collection • PLC control		• Process control supervisor • Maintenance & repair technician	• Control • Download	• Manufacturing monitoring • Manufacturing coordination • Distributed manufacturing control • Process control alarm reports	• Medical imaging • Patient care info system	• File transfer • File access • Database access • Print server • WAN access • Imaage distribution • Application load • E-Mail • Voting	• File transfer • File access • Database access • Print server • WAN access • Imaage distribution • Application load	• File transfer • File access • Database access • Print server	• File access • Transaction • File transfer • Terminal emulation	• POS • Price check • Program down;oad • Inventory • Shipping	• POS • Price check • Program down;oad • Inventory • Shipping	• POS • Price check • Program down;oad • Inventory • Shipping	• Data collection • Database access • Real-time voice	
Application Initiation				1 s	1 s									Poisson, 600 s									
Application Duration				4 Hr	4 Hr									Poisson, 300 s									

Four Configuration Modes Emerge

Number of Stations	21 or 5000	36 or 1000	45	116 or 5000
Station Density (Number/Hectare)	<10	<100	<1000	>1000
Median Dimension (m)	100	100	50	15
Mean Dimension (m)	819	230	159	42